SOUTHEAST BRANCH EXPANSION FEASIBILITY STUDY

District of Columbia Public Library Facilities Management
MCKISSACK – HILL, PARTNERS FOR A NEW COLUMBIA
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I. Executive Summary

The District of Columbia Public Library (DCPL) has a desire to expand and modernize the Southeast Neighborhood Library that is located off the Eastern Market Plaza in the Capitol Hill National and District of Columbia Historic Districts. The Barracks Row Main Street neighborhood association has developed a conceptual design for the library expansion as a part of their study on how to revitalize the entire Eastern Market Plaza area. Concurrently, DCPL has established their program requirements for the expansion which include 3,500 square feet of additional space. DCPL subsequently hired McKissack & McKissack to examine the feasibility of the Barracks Row design and, if necessary, to prepare alternative designs that may suit DCPL’s needs and capital budget.

McKissack began the study by reviewing available record information and visiting the Southeast Library to perform an analysis of the existing facility. Items considered during this analysis include historical preservation, Americans with Disabilities Act (ADA) and building code compliance, zoning compliance, utilities, structural components and mechanical, electrical and plumbing (MEP) systems. Deficiencies and areas of concern include ADA egress during power outages, evidence of current or previous water damage both interior and exterior, aged or failing HVAC and MEP equipment and lack of emergency backup power. Even if there were to be no expansion and renovation effort, the items outlined in this report are recommended to be addressed in the short to medium term. Due to historic district requirements, zoning and physical site characteristics there are limited options for expansion into new space.

The Barracks Row design calls for the addition of approximately 15,000 square feet by dropping down below the existing basement, crossing under 7th Street SE and creating a pop up element in the Eastern Market Plaza. The large amount of additional space offers DCPL flexibility in how the space is utilized and activates the Eastern Market Plaza as envisioned by Barracks Row Main Street. However, this design presents several challenges including excavating 2 ½ stories under the existing building, crossing under utilities in 7th Street SE, upgrading utilities and MEP equipment, water table location, excavation and vibration impacts on the library and neighboring buildings, the need for a land use agreement with another DC government agency and encroachment on WMATA buffer zones. The estimated cost to build the addition and upgrade the required systems is $29.8 million. This does not include costs to renovate the existing library space.

The first alternative considered by McKissack is to underpin the foundation, excavate within the existing footprint of the building, lower the basement floor to allow more headroom on that level and construct a new level underneath. The space created by this design is approximately 630 square feet more than the library has requested and offers other benefits as well. Some of the benefits include staying within the DCPL site including so there is no crossing of 7th Street, no encroachment on WMATA, no need for a land use agreement with
another agency and remaining above the water table. Potential issues with this design include underpinning and excavating beneath the entire footprint of the existing building and potential vibration impacts on the library and neighboring buildings. Since the addition is below ground, the expansion could occur outside of the footprint adding 1800-2000-sf of floor space over the 4,132-sf without exceeding the lot boundaries. The estimated cost to construct the additional space and upgrade the required systems is $10 million, which does not include the cost to renovate the existing library space.

The next alternative considered is a structure like the Barracks Row design, with the primary differences being a smaller, prefabricated tunnel under 7th Street SE and a smaller footprint under the Eastern Market Plaza which would still provide an additional 10,000 square feet of space. The advantages of this design include less time and disruption for crossing 7th Street and no encroachment on WMATA buffers. Other advantages and challenges remain similar to the Barracks Row design. The estimated cost to construct this additional space and upgrade the required systems is $19 million, excluding costs to renovate the existing library space.

A third option that was briefly explored is renovation of the existing attic into usable space. Several obstacles to this option were discovered that ultimately ruled it out of consideration. First, the attic does not provide the requested 3,500 square feet of additional space and much of what would be available would be taken up with accessible circulation features and an elevator. Zoning allows only three occupied stories and the historic district does not allow alterations to the roofline so there is no opportunity to add a floor above. Those issues combined with the extensive structural alterations required to accommodate the extra loads disqualified this alternate design.

A combination of factors leads to the recommendation that the first alternative option of underpinning and adding a floor beneath the existing basement be pursued. This option provides the library with the requested amount of space while eliminating many of the risks and obstacles associated with crossing under 7th Street and utilizing the Eastern Market Plaza. With this design the Southeast Library stays within its own property, meets zoning and historic preservation requirements and has a significant cost savings over the other options. The cost savings allows DCPL to achieve the required space and at the same time renovate and modernize the existing facility.
II. Overview

The historic Southeast Library is a two-story structure with approximately 9,600 square feet of space. DCPL is planning to update the facility to meet 21st century needs, serve the needs of the community as identified in their Strategic Plan, and perform critical building maintenance.

DCPL has created a program of additional or enlarged spaces to meet the needs of their community. The estimated total amount of additional space required is 3,500 square feet. These spaces include: one large meeting room, one smaller conference room, 3 - 4 study rooms, ample table workspace with electrical power and lounge style seating areas, large staff workroom, additional outside materials return near entrance, complete restroom modernization and expansion, larger staircase, Friends of the Library storage space, new elevator, modernization of HVAC, accessibility upgrades for ADA compliancy, some type of garden or outside seating area, large stroller area, children’s computer stations, and an open play area.

Due to the status of the building and the surrounding historic district, design options for expansion are limited. A local neighborhood association – Barracks Row Main Street – commissioned a design study that focused on revitalizing the Eastern Market Metro Station plaza to connect the community, public transit, and the 8th Street, SE business district. The Barracks Row Design identifies the Metro Plaza land adjacent to the Southeast Library as a location for the Library to expand with most the new structure, including a tunnel to the existing building, to be underground.

DCPL has asked McKissack & McKissack to analyze the state of the Existing Facility, assess the feasibility of the Barracks Row Design option, and investigate potential Alternative Designs to identify the most appropriate course of action.
III. EXISTING FACILITY ANALYSIS

A. Historic Preservation / Architecture

The DCPL Southeast Branch has not been individually nominated or designated as either a District or National Historic Site. However, since it resides within the Capitol Hill National and District of Columbia Historic Districts which include over 8,000 contributing structures; and it was built during the Historic District’s period of significance it would likely be a contributing structure.

The “Southeastern” Branch opened in 1922 as the last of four District libraries built with a grant from the Carnegie Foundation.

B. Code / ADA Compliance

The Library Occupancy under the current DC Building Code is Assembly A-3.

The largest accessibility issue facing the Southeast Library is the fact that there is no accessible egress from the main level reading room. This could be accomplished via the elevator if it were configured as an egress elevator and connected to the generator. Based upon the Electrical Engineer’s field observations, this does not appear to be the case.

The restrooms on the lower level appear to have been renovated within the last 10 years and appear to meet the current accessibility code.

There is a 1980s-ramp addition on the north side of the building which provides a ramp into the lower level. This ramp also appears to be compliant with current accessibility code. The entry door at the top of the ramp leads directly into a lobby area served by an elevator that appears to have been added in 2007.

The existing stairs require further analysis as to code and egress capacity compliance. The stairs from the main level up to the mezzanine level below the attic at the East end of the building are not code compliant which may limit what can be done with that space.
The existing building does not have a Fire Sprinkler system but the current square footage is below the DC IFC threshold that would require the installation of such a system. If the renovations lead to a total gross square footage of 12,000 or more, then the building will need to have a Fire Sprinkler system installed.

Further analysis is required but the main level appears to fall below the 5,000 SF threshold that would require a second means of egress.

C. Zoning Code Analysis

Under the newly implemented 2016 Zoning Ordinance, the Library is within the RF-1 (Residential Flat) Zone and is a permitted use within this zone.

The existing Library building site information is as follows:

- Lot Area is 6,431 SF
- Building Floor Plate is 4,132 SF
- Total Building is 9,600 SF
- Lot Occupancy is 64.25%

Zoning for RF-1 includes:

- Library Use
- 35 Foot Building Height
- **3 Stories** excluding Penthouse
- 1 Story /12-Foot-High Penthouse
- Setbacks are based on other buildings on the block
- 20' Rear Yard Setback
- No Side Yard Setback on a corner lot

The existing Library building is not compliant with the current zoning rules for Lot Occupancy for non-residential structures:

- Maximum Non-Residential Lot Occupancy is 40%
- Building pre-dates May 12, 1958 Zoning so existing Lot Occupancy may remain but cannot be increased

D. Site Utilities

The Southeast Library water needs are served by a 2” water service per the 2001 Office of Property Management (OPM) Building Condition Survey report. That same report indicates that the water service enters the building at the basement level from D Street on the north, with the water meter located in the employee break room. From the existing building drawings provided by DCPL and DC Water records, it appears that the water service enters the building from 7th Street SE on the east. The water service is adequately sized for the existing facility.

The library is currently served by a gravity sanitary sewer system. Record of the sewer lateral location has not been found. However, based on the location of the restrooms it is believed that it enters the building from the south or the east. The sanitary lateral is adequately sized for the existing facility.

Stormwater from the roof is directed to four downspouts located at the corners of the building. The downspouts discharge rainwater onto the surrounding ground surface. Rainwater that falls on the ground surrounding the building that doesn’t infiltrate into the ground makes its way to the sidewalk and eventually to the municipal storm sewer system through roadside inlets. The OPM Building Condition Survey indicates that no flooding or drainage issues have been reported.

The 7th Street SE right-of-way contains several known underground utilities. There are two combined sewer pipes and two water lines. There is an 18-inch diameter sewer at approximate invert elevation 64 under the sidewalk on the east side of the street and a 24-inch diameter sewer at approximate invert elevation 65 under the west sidewalk. There is a 6-inch water main near the centerline of 7th Street and a 20-inch water main near the east curb line. Water mains are typically constructed with 3 to 4 feet of cover, so the water mains can be anticipated to be at elevation 68-70. Additionally, there may
be other underground utilities that remain unknown at this time. Washington Gas and Pepco have not responded to requests for record information to identify facilities that they may have. However, McKissack has accessed project plans for a nearby development that appear to show a Pepco duct bank that is located near the center of 7th Street.

Overall, the existing site utilities provide sufficient capacity to maintain the existing library and pose no immediate concerns.

E. Structural Conditions

1. Existing Structural System

Roof: Tongue & groove wood planking bearing on solid sawn wood rafters supported by heavy timber wood purlins and heavy timber wood trusses. Cripple stud bearing walls are present along the top chords of existing trusses, supporting solid sawn wood rafters above. Heavy timbers serving as truss cross bracing are present at multiple locations.

Floor: Attic floor framing / first floor ceiling framing consists of solid sawn wood joist framing. Although not directly observable, framing of the main (first) floor is believed to consist of either solid sawn wood joist framing, or concrete and terra cotta infill “pan joist” construction, the latter of which was common floor construction for commercial buildings constructed in the District in the early 1920s.

Walls: Perimeter bearing walls and observed foundation walls consist of multi-wythe brick masonry capped with decorative carved stone coursing around the exterior perimeter of the building. At the interior, the walls of the elevator shaft likely consist of concrete masonry unit (CMU) construction, although this could not be confirmed. It was reported that a garage door opening supported by an overhead transfer beam was once present at the northern end of the western façade. However, this could not be confirmed.

Foundations: Although not directly observable, existing footings likely consist of concrete spread footings supporting the existing columns, and concrete strip footings supporting perimeter wall construction.
Front portico and entry: The front portico consist of four columns supporting an upper pediment feature, all constructed of mortared cut stone masonry, with stone stair treads.

Basement floor: Although much of the basement floor construction is believed to be concrete slab on grade construction, a small area just outside of the mechanical room is believed to be framed with a wood platform. It could not be determined if the wood platform framing bears on a concrete slab on grade below.

2. Cursory Structural Condition Assessment.

The following areas of concern were noted during the October 18th walkthrough of the building. These items are independent of the proposed new work illustrated by the Barracks Row drawings. It is recommended that a more thorough building assessment and investigation be performed as part of future comprehensive upgrades and expansion to identify other areas of possible concern.

Roof framing water stains: Within the attic space, water staining was noted at multiple locations along the underside of the existing roof planking, and at multiple wood structural members. It is not known if the water staining represents an active roof leak condition, or if the water staining is the result of past roofing system leaks which have since been repaired.

Foundation wall moisture infiltration: At multiple locations, moisture damage was observed at the finishes present along the interior faces of the exterior perimeter walls, suggesting that moisture is permeating through the foundation wall assembly. Although original foundation wall construction may not have included a below-grade waterproofing membrane, it could not be determined if subsequent exterior foundation wall waterproofing retrofits have been executed in the past.

West wall interior plaster damage: Localized plaster damage due to moisture infiltration was noted at the interior of the west wall, just above the decorative wooden fireplace surround of the main book stack and reading room. Given the location of the observed damage, it is likely that the moisture infiltration is related to chimney / roof flashing. However, the roof was inaccessible during the October 18th site visit.

Photo 3.E.2: Water damaged plaster
Mortar joint pointing: Exterior brick mortar joints were observed to be moderately weathered to significantly weathered. Cracked mortar joints were noted along the horizontal belt course of masonry present at the north façade of the building. Open mortar joints were more common at the upper stone masonry coursing, particularly at head joints between adjacent stone masonry units.

Lintel rust jacking: Rusting of steel plate or steel angle lintels supporting masonry construction above perimeter wall openings was observed. At one location along the north façade, steel lintel rusting has resulted in significant deformation of the steel member. Signs of past mortar joint repairs corresponding to locations where the steel member is supported by the perimeter jambs was observed, suggesting that past rusting had resulted in cracked and damaged mortar joints. Subsequent cracking was observed at several of these repaired mortar joints, particularly at the north façade. At one location, rust jacking has caused additional masonry wall damage beyond the previously repaired area.

Basement floor distress: At the location where the basement floor is believed to be framed with a wooden platform, existing floor finishes were observed to be cracked/distressed at multiple locations, suggesting that the wood subfloor framing is either decayed, damaged, or not suitably detailed to support linoleum floor finishes.

F. Mechanical, Electrical, and Plumbing Systems

Southeast Branch Library is a historic building and holds a prominent site on the property overlooking the Capitol Hill community. The design of the library occurred in 1922 and construction took place shortly thereafter. Most of the MEP systems are original to the building except for several HVAC modifications that took place in the early 2000’s that replaced an air-cooled chiller system, replaced a water recirculating pump and replaced fan coil units. Preventative maintenance has not been regularly performed over the past 10 years and as such most of the mechanical equipment is approaching or past its useful life.

1. Existing Mechanical Systems Findings

Hot Water Heating Boiler: The Weil-McLain duel fuel (no. 2 fuel oil and natural gas) hot water heating boiler is new and provides heating hot water to the air handling unit serving the basement meeting room as well as the fan coil units serving basement areas and first floor perimeter areas. There are operational problems with pumping system as the one hot water and chilled water pump has been tagged as not safe for use. The pump is old and should be replaced.
**Lower Level Air Handling Unit:** The air handling unit serving the Basement Meeting room is an original piece of equipment and does not provide the proper amount of heating, cooling, or ventilation to this space to satisfy the current Energy and International Mechanical Code requirements. Heating is provided from the boiler heating hot water system and cooling is provided from a direct expansion cooling coil with refrigerant piping extended to an air cooled condensing unit located outside the building. The condenser is not working. This air handling unit is currently not working and both units should be replaced.

**Fan Coil Units:** The fan coil units provide heating and cooling of the basement, main reading room and mezzanine office throughout the building. The units have been recently replaced and seem to be operating properly. Thermostats are integral to each unit with an adjustable knob and fan switch within the unit housing.

**Circulating Pump:** The one hot and chilled water circulating pump located in the mechanical room conveys heating hot water and chilled water to all fan coil units and heating hot water to the one air handling unit heating coil.

**Chiller:** The air-cooled chiller (nominal 30 tons) is mounted on a concrete pad outside the building. The chilled water piping extends from the unit around the perimeter of the building into the basement mechanical room. The chiller was replaced in 2014 and should remain.

2. **Existing Electrical Systems Findings**

**Service:** Presently the Building is provided with 400A, 3 Phase, 4 Wire, 120/208V underground electrical service from a PEPCO manhole South-east of the building.

**Power:** The power company transformer serves a 400A-120/208V-3 Phase-4 Wire panel which in turn provides power to lighting and power panels throughout the building (Total 3 panels), elevators, and HVAC equipment. Power to fluorescent lighting and heating equipment is provided via various feeding panels located in throughout the building. Power to receptacles and 120V lighting is also provided from the same 120/208V feeding panel boards. The HVAC equipment is served by the older 400A main panel located in the main electrical room in lower level. All feeders from Switchboard to panels and switches are copper; condition of the wires could not be identified. Electrical outlets are strategically located where needed throughout the Building and they are in satisfactory condition.
**Emergency Power:** The Building is equipped with an outdoor 1208/208V-3 Phase-4 Wire emergency generator; the capacity of the generator couldn’t be identified. The protection doors couldn’t be open to verify the generator capacity and plate information. The generator exact load couldn’t be identified, but probably serving emergency lighting, exit lighting, building elevator and Fire Alarm system.

**Lighting:** The Building normal lighting is comprised of recessed fluorescent with acrylic or parabolic lens in general offices and reading rooms. Continuous recessed fluorescent and compact fluorescent downlights in hallways and general storage and utility rooms. Wall mounted compact fluorescent downlights in stairwells. Industrial pendant fixtures with compact fluorescent lamps are available in Mechanical, Electrical and Telephone/Data rooms.

**Emergency Lighting:** The emergency lights consist of lighting fixtures part of the exit signs at egress areas corridors and lobbies connected to emergency power.

**Exit Lighting:** Most the exit lights are properly located at egress exit corridors and lobbies.

**Fire Alarm System:** The Fire Alarm system is addressable type 4100U manufactured by Simplex and consists of a control panel in lower level main electrical room, annunciator panel in main level entrance, smoke detectors in most of the Building, pull stations at egress areas, horns throughout and ADA strobes in most of the areas.

**Tele/Data Systems:** The incoming telephone service and the main Telephone/Data room is in the Lower Level next to the stairs leading to the main level. This MAIN location serves each floor with Tele/Data Systems equipment (fiber optic, wireless etc.).

3. **Existing Plumbing Systems Findings**

**Piping:** Similar to HVAC, plumbing piping domestic hot and cold water should be removed back to the incoming service. In addition, the gas fired water heater tank is past its useful life and should be replaced to meet anticipated new potable hot water requirements.
**Drainage:** There are no storm drains serving the existing building. Gutters and downspouts convey all storm water from the sloped roof down to grade.

**Gas Service:** The natural gas service enters the south side of the building with a gas meter and regulator mounted adjacent to the wall. The meter and regulator appear to be a low-pressure service. The gas service will be modified to accommodate new connected load of the gas fired equipment for the proposed renovation/expansion.

**Generator Fuel:** The emergency generator serving the building is a diesel fired unit. This unit is currently not operational. If the generator is increased in capacity, a natural gas fired generator may be provided to eliminate the diesel tank and piping. Gas service would be extended from a separate meter to the generator.

**Domestic Water:** The existing 2" domestic water service enters the building on the north wall. There is a meter vault in the sidewalk and the water line enters a storage room on the basement level with water meter and a shut-off valve. A new backflow preventer must be installed for the incoming domestic water which will upgrade the building to 2012 International Plumbing Code standards.

**Fire Protection:** There is no fire protection service provided for the existing library building. The occupancy rating of A-3 for a library building requires a fire protection system if the building area exceeds 12,000 square feet. The existing building currently falls below that mark. A new fire service line may have to be provided to service the increased building area that would include an expansion and proposed connector between the existing building and a new library access pavilion across 7th Street, SE. The proposed connector will be constructed below ground and will be required to have an automatic sprinkler system to comply with IBC 903.2 of the International Building Code, 2012 Edition.
G. Recommendations for Work Required in the Existing Building

The following remedial work is recommended in the short term to maintain the building.

1. Architectural:

   Accessible Egress: The top priority should be to achieve an accessible path of egress from the Main Reading Room Level. This space is the primary functional area but accessible egress is only available via elevator from the Lower Level. If a long-term expansion effort is not undertaken in the short term, the existing elevator could be connected to an emergency generator for egress use or the front stairs could be reworked or added to in order to provide access.

2. Structural:

   Roof framing water stains: It is expected that the areas of possible water infiltration will be addressed as part of the proposed reroofing work identified on the Barracks Row conceptual drawings. Evaluate existing water-stained members for signs of decay and failure. Replace existing damaged tongue and groove roof planking. Sister or replace existing damaged wood framing members with new members.

   Foundation wall moisture infiltration: Execute comprehensive foundation wall waterproofing around the exterior perimeter of the building, and install a perforated foundation drain.

   West wall interior plaster damage: It is expected that the possible insufficient / failed flashing detailing around the rooftop chimney will be addressed as part of the proposed reroofing work identified on the Barracks Row conceptual drawings. Evaluate existing wood framing near the existing chimney at the west, and execute appropriate repairs, sistering of existing wood framing members, or replacement with new members.

   Mortar joint pointing: Perform mortar analysis of existing mortar. Execute mortar joint repointing at all weathered mortar joints. Repointing shall consist of removal of existing mortar from the existing mortar joints to a depth of at least two times the mortar joint thickness (1/2” minimum). New pointing mortar shall be placed in lifts. Based on the results of the mortar analysis, new pointing mortar shall be carefully selected to ensure...
compatibility with the existing historic masonry wall assembly. It is recommended that the project require use of a masonry repair contractor who specializes in repair of historic brick masonry, and can demonstrate a minimum of three successfully completed projects over the past five years which are similar in size, scope, and detailing.

**Lintel rust jacking:** Evaluate each existing steel lintel for signs of distress. Remove and replace existing deformed and/or heavily rusted lintels with new galvanized steel lintels. At existing lintels, which have minimal section loss and minimal rusting, clean all exposed surfaces of the lintel down to bare metal, and apply a rust-inhibitive primer coating prior to applying final finish coat. Note that some amount of brick unit removal and reinstallation is likely to be required at several locations.

**Basement floor distress:** Remove existing floor finishes and existing wood platform framing. Install new concrete slab on grade construction on a vapor barrier.

3. **Mechanical**

**Existing Piping:** The existing piping system is original to the building and is subject to leaks. All chilled water, hot water, and condensate piping should be replaced back to the equipment source of service. The existing piping distribution is a two-pipe system utilized for both heating and cooling. Replacing the piping would eliminate the seasonal changeover issues that affect comfort conditions. All pumps and heat exchangers should also be replaced with new equipment that can be sized to meet the load requirements of a proposed renovation/addition.

**Existing Ductwork:** All existing ductwork from air handling units and exhaust fans is extremely dirty and should be removed back to the equipment source. Existing ductwork may not be sized adequately to handle the new ventilation requirements.

**Exhaust Fans:** Exhaust fans serving the toilet rooms, elevator machine room, basement kitchen and engineer’s office are original to the building and are functional but should be checked for proper operation. Replacement is recommended. The wall mounted exhaust fan serving the first floor reading room is used for ventilation when hot and humid conditions occur in the space. The fan has a wall mounted exhaust grille and is noisy. Replacement is recommended.
Convector: There are various electric convectors throughout the building that are functional and should remain and be used for the renovated space heating as needed.

Hydronic Piping: The existing hydronic piping serving the first-floor heating and cooling system extends along the perimeter wall above electrical panels inside the basement electrical room. This is a code violation and all piping must be relocated to avoid the electrical panels.

4. Electrical

Power: The main 400A service equipment is very old (no exact date could be identified), missing the main disconnect switch and in a poor operating condition. The existing hydronic piping serving the first-floor heating and cooling system extends along the perimeter wall above electrical panels inside the basement electrical room. This is a code violation and all piping should be relocated to avoid the electrical panels. The Main 400A Panel is old and reaching the end of its useful life, parts will be difficult to be found within few years. All of feeding panels (except for newer 200A MDP panel and the sub-panel fed from it in the main electrical room), are of old age, and will be reaching the end of their useful life, parts will be difficult to be found within few years. Outlets are of old age, they will be reaching the end of their useful life, within few years.

Generator: The generator is in a very poor condition, and seem to receive no maintenance for an extended period, signs of rust are starting to appear on the generator inner parts.

Lighting: Most lighting fixtures above are in fair conditions with remaining life of approximate 10 years. The exit lights conditions are satisfactory with various remaining life expectancies, due to their various types and different times of installation.

Fire Alarm: The Building Fire Alarm System was updated in 2003 and it is in good operating condition. Presently it meets the local and national Fire codes.

Tele/Data Systems: Tele/Data Systems equipment seem to be maintained properly and meet the needs of the Library visitors.
5. **Plumbing**

**Piping:** Replace all distribution piping and reroute as required in locations where the existing route is above electrical equipment.

**Equipment:** Replace water heater and install backflow preventer for code compliance.
IV. **Analysis of Barracks Row Design**

A. **Architectural Analysis of Barracks Row Design**

**Metro Plaza Focused:** The Barracks Row design is heavily focused on activating the existing Metro Plaza and is part of a larger study for the six parcels of land bounded and intersected by Pennsylvania Avenue, South Carolina Avenue, and D Street, SE. None of these properties is owned by DCPL. This design was commissioned by the business owners’ association along 8th Street to the South and was not conducted with DCPL as the primary beneficiary.

![Figure 4.A.1: Barracks Row rendering of Metro Plaza](image)

**Non-DCPL Property:** The proposed design expands the library underground into Parcel 4 which is a DC Park Services property. DCPL would need to sign a Memorandum of Understanding with an outside agency to utilize the land and may have additional financial and/or maintenance obligations as a result.

**Excavation Depth:** The depth of the existing sewer pipes and water main below 7th Street, SE and the adjacent sidewalks is dictating the required tunnel depth below grade. In order to reach this depth, the existing historic building will need to be underpinned to undertake a 2 ½ story excavation beneath it.
**Tunnel Ceiling:** The proposed tunnel design includes two reinforced drops in the ceiling plane which will block ductwork, piping, and impact the lighting in the tunnel. As a result, additional tunnel width is required to run the services along a parallel corridor.

**Square Footage Gains:** This design provides a tremendous gain in usable square footage for DCPL services and functions to take advantage of by adding about 15,000 SF which results in a total facility square footage of close to 25,000. The downside to this gain comes from the additional operating costs for such a large facility: maintenance, cleaning, heating and cooling, lighting, water, etc.

**Eastern Market Metro Proximity:** The current design conflicts with the WMATA 25-foot clearance zone. This conflict affects 635 SF of space that is shown in the zone where pile driving for foundation work is prohibited. This proximity to the Eastern Market Metro Station also brings WMATA into the reviews process and potentially adds more time to the overall schedule.

*Figure 4.A.2: Barracks Row rendering of underground expansion*
B. Infrastructure Analysis of Barracks Row Design

1. Building Utility Impacts

   **Existing Sewer:** The presumed location of the existing sewer lateral on the east end of the building will be impacted by the construction of the proposed addition. At least a portion of the lateral will need to be removed and replaced in the same location once underground building construction is complete.

   **Sewage Service:** The new structure will not be able to be served via gravity sewer. A sewage ejector or pumping system will be needed to serve the restrooms which are located at a lower elevation than the nearby sewer. DC Plumbing Code states "Pumps connected to the drainage system shall connect to a building sewer, building drain, soil stack, waste stack or horizontal branch drain". The easiest way to accomplish this is to place an ejector or pump system near the restrooms in the addition and pump the waste to the sewer lateral that is replaced in the original location.

   **Domestic Water Service:** The existing 2-inch water service on the east side of the building will be required to be removed for construction of the addition to the library. The addition will require fire suppression sprinklers, which necessitates a larger water service. Once the underground structure is complete, a new 4-inch water service can be installed in the same location as the existing service. In addition, a new fire department connection will be required to be located somewhere on site where the fire department can connect their equipment in case of a fire.

   **Natural Gas Service:** The existing gas service enters the building near the southwest corner from South Carolina Ave. SE and will not be impacted by the new addition. The electric service likewise enters from the south. That service will be impacted by the construction and will need to be removed and replaced.

   **Other Underground Utilities:** No other underground utilities are known to be on the library site.

2. 7th Street Utility Impacts

   **Excavation Impact on Public Way:** With the anticipated open-cut excavation for the construction of the building under 7th Street, there will be impacts to the utilities located in the right-of-way. The existing utilities will need to be maintained during construction. Supporting a pipe across a narrow trench excavation is the normal approach to crossing under an existing utility. However, this excavation will be too wide to practically support the existing utilities, particularly considering the age of the piping. The existing water and sewer will need to be relocated or bypassed during construction. Relocation is not practical as it would require extensive construction of...
utilities well outside of the library site, adding significant cost. Therefore, temporarily bypassing the utilities during construction will be necessary.

**Excavation Impact of Metro Plaza:** Construction across 7th Street will likely be completed in partial width stages. This would allow bypassing of just one sewer and one waterline at a time. Bypass systems would need to be put in place and then the segments of pipe that are in conflict removed. Once building construction is complete, the piping can be replaced back in the original location. Sewers can be bypassed by plugging the line at a manhole and using a portable pumping system to pump to another manhole farther downstream. Water lines will need to be cut into on either side of the construction zone and a temporary line run around the excavation above ground.

**Other Underground Utilities:** Other underground utilities are believed to be in 7th Street, but records have not been received. These utilities would likewise need to be temporarily bypassed, removed and replaced during construction of the building.

3. **Traffic Impacts**

During construction of the building addition under 7th Street, both vehicular and pedestrian traffic will be impacted. 7th Street is carries two-way traffic and has a parking lane on both sides. The on-street parking will need to be eliminated during construction. Vehicular traffic will face a bigger impact than pedestrian traffic. Pedestrian impacts will be minimal, with the ability to simply cross the street and then cross back one block later. With no on-street parking and partial width staged construction, traffic can be maintained in one direction. During construction under the west half of the street, northbound traffic can be maintained on the east side and southbound traffic can be maintained during construction under the east half of the street. For both vehicular and pedestrian traffic, standard DDOT maintenance of traffic approaches and standards will be sufficient.

4. **Existing Trees**

There are a couple of large trees on the east side of the library that will be impacted by construction. The trees have drip lines that nearly touch near the main entrance.
These trees would need to be removed for construction of the large underground addition. The Urban Forestry Administration tracks large and historical trees and imposes a fine if they are cut down. There is a non-profit group that tracks DC street trees and other trees of significance on their website at http://caseytrees.org/resources/maps/dc-street-trees/. McKissack will determine the amount of these fines and include those costs in the Final Report’s Cost Estimate.

5. **Constructability & Budget Concerns**

**Conventional Means:** From a utility constructability standpoint, there are no unconventional means and methods of construction required to build the addition to the Southeast Library. It is anticipated that industry standard approaches to construction will be suitable.

**Bypassing:** From a budget perspective, the most expensive utility aspect of the project will likely be the bypassing, removal and replacement of the utilities in the 7th Street right-of-way. Bypassing the sewers will be the most expensive. Because the sewers are combined sewers that carry both sanitary and storm flows, it must be assumed that they at times run at full capacity, unless reliable flow data is available that shows otherwise. To bypass the 24-inch sewer, assumed to have a 0.50% slope, the bypass pumping system must have a capacity of 16 cubic feet per second.

**Potential Unknowns:** Other utilities that have not yet been identified may also pose a significant cost to bypass.

C. **Structural Analysis of the Barracks Row Design**

The proposed scheme illustrated by the Barracks Row drawings will require several structural engineering design and construction considerations.

1. **Alterations to the Existing Facility Required by the Design**

**Sub-Basement Below-Grade Addition:** In order to create circulation and communication with the new proposed below-grade construction below 7th Street SE and below the existing outdoor terrace known as “Market Park” (bound by Pennsylvania Avenue SE, 7th Street SE, D Street SE, and 8th Street SE), significant below-grade excavation is proposed, which will create a new below-grade stair tower, elevator lobby, and mechanical room at the eastern end of the building (approximately 45% of the existing building footprint). Anticipated structure is as follows:

**Underpinning:** The proposed new excavation will extend downwards approximately 30 feet from existing top of basement slab elevation, requiring extensive underpinning of the perimeter foundation walls of the existing library structure. Given the depth of excavation and resulting height of underpinning construction, it is likely that
conventional approach—pit reinforced concrete underpinning is feasible if permanent intermediate wall bracing is incorporated into the design. Permanent bracing may consist of permanent grouted earth anchors projecting beyond the footprint of the building, or some means of internal bracing such as a framed concrete slabs or steel bracing.

**Concrete Perimeter Walls:** Along the perimeter of the new below-grade basement addition, and beyond the exterior perimeter underpinned walls, new cast in place concrete foundation wall construction will be required. Given the depth of excavation and resulting height of the perimeter foundation walls, some means of permanent intermediate wall bracing is anticipated. Permanent bracing may consist of permanent grouted earth anchors projecting beyond the footprint of the building, or some means of internal bracing such as a framed concrete slabs or steel bracing.

**Stair Tower Walls:** Interior stair tower walls are expected to be reinforced CMU construction.

**Elevator:** Elevator shaft walls are expected to be constructed of reinforced CMU construction. The elevator pit walls extending below the new basement slab on grade shall be constructed of reinforced concrete, and will bear upon a new 12” minimum reinforced concrete mat slab. A sump recess will likely be detailed into the concrete mat slab at the base of the elevator pit.

**Stair and Railings:** The new stair is expected to consist of a conventional miscellaneous metals steel stair with metal pans and concrete infill treads and landings. Alternatively, stairs and stair landings may be framed in reinforced concrete. Railings are expected to be conventional pipe sections fastened to the perimeter walls.

**Existing Lower Level Floor Construction:** Due to the depth and extent of underpinning, new floor construction will be required at Lower Level 1 elevation (El. +76’-9” T.O.S.). Floor construction at this elevation is expected to consist of reinforced concrete slabs and beams.

**New Sub-Basement Floor Construction:** Floor construction at the new basement space is expected to consist of a 5” thick concrete slab placed on a vapor barrier and 6” minimum thickness of crushed stone. The slab shall be reinforced with welded wire mesh placed 1 1/2” below top of slab, with control joints saw cut into the slab to control shrinkage cracking during curing.

**Temporary Shoring:** To create the proposed below-grade excavation and addition, careful temporary shoring of the existing building structure will be required, as the proposed work coincides with a number of load bearing structural elements at the interior footprint of the building. Although it could not be determined during the
October 18th site visit, it is believed that the interior walls at the main entryway at the east end of the building may be bearing, or may conceal load-bearing columns. Two additional load bearing columns are located within the footprint of the main book stack and reading room. The interior load-bearing structural elements will require temporary shoring to be installed prior to the commencement of excavation and underpinning activities. In addition, the design of the new structure will need to incorporate the loads of the existing structure into the new structural scheme. Careful construction sequencing, means and methods will also be required to transfer the loads of the existing structure to the new structure prior to removal of the temporary shoring system.

**New Lower Level Slab on Grade:** At the existing building footprint beyond the footprint of the below-grade addition (the remaining approximately 55% of the existing building footprint), approach-pit concrete underpinning of the existing perimeter walls is anticipated, as the Barracks Row concept includes lowering the basement floor elevation of the remainder of the basement space to create a taller ceiling height. New basement floor construction will consist of a 5" thick concrete slab placed on a vapor barrier and 6" minimum thickness of crushed stone. The slab shall be reinforced with welded wire mesh placed 1 1/2" below top of slab, with control joints saw cut into the slab to control shrinkage cracking during curing.

**Roof Alterations:** To accommodate new rooftop HVAC equipment, alterations of the existing roof framing to create a new recessed “pocket” are proposed. The proposed HVAC pocket corresponds to the existing relatively flat portion of roof area. To create this feature, demolition of the existing skylight and flat roof wood joist framing will be required, followed by reframing with new structure. Based on the schematic Barracks Row drawings and limited preliminary site observations, it could not be determined if alterations to the existing heavy timber wood roof structure (trusses and roof purlins) will be required. Given that all existing roof framing and attic floor framing appears to be composed of wood construction, it is believed that new infill construction will consist of either LVL framing or LVL flitch beam framing. The structural engineer of record for the new work will need to coordinate the design of the new framing with the operating weight(s) of the HVAC equipment specified by the mechanical engineer of record. In addition, it is recommended that the structural
engineer of record analyze the existing roof framing to remain, as the new HVAC pocket may change existing loading conditions. Pending the results of this analysis, some amount of structural reinforcement of the existing structure to remain may be required.

**Front Portico and Exterior Stairs, Railings, and Sidewalks:** To create the new below-grade space illustrated in the Barracks Row scheme, full cut-and-cover excavation is anticipated between the east façade of the existing building and the east extent of the new below-grade space. Given the footprint of the proposed below-grade improvements, the existing below-grade utilities located beneath 7th Street SE, and the limited overburden above the ceiling of the proposed new addition, it is not believed that conventional tunneling means are feasible for this effort. Rather conventional cut-and-cover construction is anticipated. Therefore, full demolition of the existing front sidewalk, stairs, landings and railings will be required. Existing portico columns will require temporary shoring to allow the excavation to take place. The temporary shoring will support the columns and the pediment above until new structure can be constructed below. Careful construction sequencing, means and methods will also be required to transfer the loads of the existing portico structure to the new structure prior to removal of the temporary shoring system. Alternatively, careful deconstruction and reconstruction of the existing portico elements may be a more feasible option.

**Existing Mechanical Equipment Demolition:** To reconfigure the existing mechanical room, removal of the existing mechanical equipment will be required. Although not confirmed, it is possible that a temporary wall opening can be created at the northern end of the west façade, near the previous garage door opening. Alternatively, the existing equipment may be disassembled and/or cut into smaller manageable pieces and removed through the existing basement door entrance located at the far west end of the north façade. A third option which may be feasible consists of transporting the equipment to the east, and removing the equipment through the new below-grade basement addition once excavation is underway, but prior to construction of the new overhead structure.

2. **New Building Expansion Structure**

**Cut and Cover Impact on 7th Street & Metro Plaza:** The anticipated cut-and-cover construction approach is expected to require temporary (possibly partial phased) closure of 7th Street SE, as well as temporary (or permanent) relocation of the existing below-grade utilities. Pedestrian access to the Eastern Market Metro station will likely need to remain open throughout the duration of construction. Once the below-grade construction is completed, suitable compacted backfill will need to be placed, followed by construction of the various site features, pavement, landscaping, etc.
Soil Bearing Assumptions: Although no geotechnical report related to this project was provided for this effort, the geotechnical report related to the nearby Hine development was provided for reference. Refer to Appendix B for additional information. If the subsurface conditions are similar at the Southeast DC Public Library site, and assuming that the geotechnical engineer of record for the proposed DCPL improvements makes similar recommendations, conventional reinforced concrete spread footings may be feasible. Anticipated maximum allowable bearing stress may be approximately 6,000 PSF for column spread footings and 4,500 PSF for wall strip footings. It is recommended that a geotechnical engineer be engaged during the early phases of the future design effort to conduct a subsurface geotechnical investigation, lab analysis of soil samples, and ultimately produce a geotechnical engineering report which outlines the recommended foundation and other geotechnical parameters for the project.

Below-Grade Superstructure: Foundation walls are expected to consist of reinforced concrete construction. Ceiling structure over the new space will consist of conventional cast-in-place reinforced concrete flat slabs supported by reinforced concrete beams and girders. Concrete drop panels are expected along the underside of the flat slab construction, corresponding to column locations where necessary. It is recommended that consideration be given to providing a sloped topping slab bearing directly on top of the flat slab construction to reduce the risk of ponding water on top of the structure. Concrete pilasters engaged into the perimeter concrete foundation walls, along with concrete columns, will be designed to support the concrete slab construction above the new space. Although the Barracks Row drawings illustrate both 24" diameter and 24" square columns, it shall be the responsibility of the structural engineer of record to design each column for the code-required loads and load combinations.

Floor Slab Construction: Floor construction at the new basement space is expected to consist of a 5” thick concrete slab placed on a vapor barrier and 6” minimum thickness of crushed stone. The slab shall be reinforced with welded wire mesh placed 1 1/2” below top of slab, with control joints saw cut into the slab to control shrinkage cracking during curing.

Elevator: Elevator shaft walls are expected to be constructed of reinforced CMU construction. The elevator pit walls extending below the new basement slab on grade shall be constructed of reinforced concrete, and will bear upon a new 12” minimum reinforced concrete mat slab. A sump recess will likely be detailed into the concrete mat slab at the base of the elevator pit.

Stairs and Railings: Interior stair tower walls are expected to be reinforced CMU construction. The new curved stair is expected to consist of a conventional miscellaneous metals steel stair with metal pans and concrete infill treads and
landings. Railings are expected to be conventional pipe sections fastened to the perimeter walls.

**Above-Grade Building Structure – Entry Pavilion:** Reinforced 8” CMU perimeter bearing wall construction faced with 4” exterior brick veneer is expected to be feasible. To accommodate the projecting skylight clerestory, roof construction is expected to consist of steel framing bearing on the exterior perimeter CMU bearing wall construction, which will support conventional corrugated metal roof decking. The lateral force-resisting system of the entry pavilion will likely utilize the exterior 8” CMU wall construction as shear wall elements.

**Skylight construction:** Steel framing is expected to be feasible to construct the skylight features. Care shall be taken to ensure that thermal bridging of steel framing through the building envelope is avoided.

**Performance-Specified Design Items:** In accordance with industry standard practice, it is anticipated that a few items related to the work will be performance specified by the design team. For all performance-specified items, it shall be the responsibility of the general contractor to engage a specialty engineer licensed in the District to design and detail all performance-specified items. Anticipated performance-specified items include:

- Exterior components and cladding.
- Exterior storefront construction.
- Cold form metal framing.
- Steel framed stairs, landings, handrails and guardrails.
- Underpinning.
- Specialty foundation systems.
- Temporary support-of-excavation systems.
- Concrete mix design.
- Structural steel connections.
- Sheet metal and shoring.
- Scaffolding and other work platforms.
- Formwork.

**Special Inspections:** In accordance with code requirements, the Owner will be responsible for engaging a special inspections engineer of record. The required special inspections will be determined by the design team, and it shall be the responsibility of the general contractor to inform the Owner’s special inspector of the
progress of the work. It is important to note that special inspections are in addition to all applicable inspections required by DCRA. In addition, the structural engineer of record cannot act as the Owner’s special inspections engineer of record.

**Groundwater Considerations:** Based on the 2010 Hine Geotechnical Report performed by Schnabel Engineering, LLC, groundwater is expected to be a significant factor in the design and construction of the new below-grade improvements. Per the 2010 report, groundwater was encountered near elevation +57'-0". Based on the Barracks Row drawings, anticipated top of finished floor elevation for the new below-grade addition is proposed to be +50'-3". Elevator shaft pits may extend 4' to 5' below this elevation. Therefore, groundwater elevations are expected to be significantly above proposed finished floor elevations, and the design team will be required to incorporate the high groundwater level into the design of the new below-grade construction. Two options are possible, each with benefits and drawbacks:

- **Temporary water table drawdown:** This method executes temporary drawdown of the water table to allow for construction of the below-grade structures, which will likely consist of “bathtub” construction. “Bathtub” construction is characterized by specifying and installing waterproofing elements along the exterior perimeter of the new below-grade reinforced concrete structure. Once the below-grade construction is completed, pumping of groundwater ceases and is permitted to return to preconstruction levels. The perimeter waterproofing will then prevent water from entering the interior of the “bathtub” construction. This approach requires careful detailing of the waterproofing systems to create the watertight bathtub. Emergency sump pumps are occasionally incorporated into this design to serve as backup if the waterproofing fails. As waterproofing systems reach the end of their useful design lives, waterproofing repair options are limited. In addition, hydrostatic uplift must be accommodated in the structural design, which can require heavy mat slab construction and/or tension hold downs to prevent uplift. During construction, provisions to discharge the pumped groundwater must

![Figure 4.C.1: Barracks Row rendering of underground expansion cross section with water table location shown](image-url)
be accounted for. If adopted for the DCPL project, significantly more substantial and costly foundation design and construction work will be anticipated.

- **Permanent water table drawdown:** This method permanently draws down the water table both during and after construction. Although hydrostatic uplift design concerns are eliminated, permanently drawing down the water table raises geotechnical concerns, as permanently changing the groundwater characteristics within the zone of influence of the site may result in soil consolidation, which can lead to settlement and cause damage not only to the historic DCPL building but also to adjacent property. Permanent provisions to discharge the pumped groundwater must be accounted for. The flow rate and volume of pumped water may prove to be significant. In addition, emergency backup power sources are often recommended to operate the dewatering pump(s), as interruptions in the primary electrical service may result in flooding of the finished basement space.

As part of the future subsurface geotechnical investigation, it is recommended that several of the test borings performed at the site be converted to groundwater monitoring borings, and monitored by the geotechnical engineer on a periodic basis to determine how the groundwater elevation may or may not fluctuate over time. This will allow the design team to determine how groundwater elevations may or may not impact the construction project. Furthermore, it is recommended that the geotechnical engineer of record for the construction project elaborate further on the concern for disturbance of the soil at the site due to changes in moisture content, and specifically comment on the risks presented to the JFLP property because of the proposed permanent drawdown of the water table.

**Temporary Support of Excavation:** For urban construction projects located near neighboring property, conventional laid-back excavation is typically not feasible. Rather, temporary support of excavation systems is often utilized. The purpose of an SOE system is to brace the walls of an excavation and maintain the stability of soils, grades, property, and other features beyond the perimeter of an excavated area during construction to allow the new below-grade features to be created. Although the structural load-resisting capacity of SOE systems are occasionally integrated into the permanent building structure, SOE systems are usually intended to act as only a temporary means of support, with the permanent foundation walls of the primary building structure designed and constructed to resist the lateral earth pressures and adjacent surcharge loads during the design life of the building. The permanent concrete foundation walls are typically cast directly against the SOE system, with the SOE system left abandoned in place. To ensure compatibility with the architectural and structural design intent, the SOE system must be coordinated with the architectural and structural design documents. For typical construction projects, similar to the proposed DCPL improvements, and in accordance with standard
practice in the region, the structural engineer of record (SER) for the project will performance specify the sheeting, shoring, and SOE systems required for a project. The general contractor overseeing the construction activities will then engage a specialty foundation engineer and contractor to utilize the performance specification to engineer and install the system. It is believed that an SOE system will be required around much of the exterior perimeter of the excavation.

**Movement and Vibration Monitoring Program:** A movement monitoring program generally refers to the manner in which engaged professionals field verify that the installed SOE system is performing as intended during the work, and that the means and methods of the contractor are in conformance with various parameters specified by the design team. The movement monitoring program is typically performed by an engineering company with monitoring equipment and expertise, and is engaged by the Owner of the property undergoing development to represent the Owner's interests. The purpose of the monitoring program is to verify that:

- The SOE system is performing as intended during the work.
- The SOE system is in conformance with the deflection, movement and settlement criteria specified by the SER.
- Demolition, excavation and pile driving activities do not generate vibrations in excess of the vibrations specified by the design team for the construction project, as experienced at private property adjacent to the construction site.
- The underpinning means and methods are not resulting in excessive movements or settlements.
- Given the historic nature of the existing DCPL building, K&H recommends that the design team establish a thorough movement and vibration performance specification, and that the Owner engage a monitoring agency to execute the movement and vibration monitoring program during demolition, excavation and construction.

**WMATA Considerations:** Given the proximity of the proposed improvements to the existing Eastern Market Metro station entrance and the Metro tunnels below Pennsylvania Avenue SE, careful coordination will be required. In addition, it is expected that WMATA officials will need to review the proposed design and detailing prior to receiving a building permit. WMATA may also require additional monitoring of WMATA features during the work.

**Vibrations:** The anticipated construction activities may generate vibrations at various times during the construction process. First, the SOE system incorporates vertical steel H-piles which may be driven into the soil utilizing pile driving equipment. Depending on the properties of the soils present in the vicinity of the pile
driving work, the pile driving activities may induce significant vibrations in the soils adjacent to the pile being driven, and in the soils present at private property located immediately adjacent to the construction site. Second, demolition activities often utilize heavy equipment to hammer existing concrete and masonry assemblies. Although hand demolition means and methods may be utilized to raze existing above-grade construction, it is likely that more aggressive means and methods (such as jackhammering) will be necessary to demolish and remove any below-grade foundations and foundation wall structures. Excessive vibrations raise concern for several reasons:

- Certain soil types are particularly sensitive to vibration, and may consolidate (settle) when vibrated. Soil settlement can cause foundation settlement followed by cracking of interior finishes and masonry wall construction.

- Certain soil types may transmit vibration energy great distances before dissipating to an acceptable level.

- Excessive vibrations can exacerbate existing cracks and damages already present at the historic DCPL building and at adjacent property, independent of foundation settlement.

Therefore, it is recommended that the geotechnical engineer of record for the project comment on the degree of vibration and disturbance sensitivity of the soils present at the site, and comment on whether pile driving is recommended for the construction project. If pile driving is specified, it is recommended that the SOE designer specify a maximum permissible vibration value for the vibrations induced by pile driving activities with consideration given to the presence of the existing basement space, and that the monitoring program include vibrational monitoring during pile driving installation activities. Typically, vibration criteria are specified in terms of peak particle velocity (PPV), and often take into consideration the nature of the construction materials already present within the zone of influence of the work. If movements and/or vibrations exceed the specified allowable maximum criteria, action can be taken by the design and construction team to avoid risking additional damages to adjacent private property. Alternatively, the SOE designer may elect to design and specify vertical piles augured (drilled) into place rather than driven into place.
D. Mechanical, Electrical, and Plumbing Analysis of the Barracks Row Design

1. Mechanical Systems Findings

**Heating and Cooling:** The building has a duel fuel cast iron sectional boiler to provide heating hot water for the building (nominal 521 MBH). The boiler is inefficient and has only one recirculating pump which does not allow for maintenance shut-down. An air-cooled chiller (nominal 30 tons) located outside the building provides chilled water for cooling. The chiller is two years old and seems to be operating correctly. The boiler should be replaced with a unit that is approximately 800 MBH to serve the entire building. New duplex water circulation pumps for heating hot water system (80 GPM each) should be provided. New duplex water circulation pumps for the chilled water system (72 GPM each) should be provided. The duplex systems will allow for taking one out of service for maintenance. An all new heating hot water and chilled water pipe loops between equipment should be included with the duplex circulation pumps.

**Rooftop Unit:** Provide a new rooftop mounted heating and air conditioning unit to serve the main reading room (nominal 7-1/2 tons cooling with economizer operation, de-humidification controls and relief air fan, gas fire heat exchanger and DDC controls. Provide new ductwork with grilles to run overhead.

**Air Handling and Condensing Units:** The air handling unit and air cooled condensing unit are not functional and should be replaced with a new unit that will provide the proper heating and cooling and ventilation to accommodate the building load. Fan coil units provide heating and cooling for several offices in the basement. The fan coil units are operational and should remain. Unit coils should be cleaned, valves, and controls should be checked for proper operation. The fan coil units serving the first-floor main reading room should be replaced with new units that will be more efficient and provide better temperature control and a lower noise level in the space. The two “Fujitsu” split system air conditioning units are operational and should remain.

Provide a new vertical air handling unit located in the mechanical room to service the basement meeting room and staff work room. The new unit shall have a hot water heating coil and a direct expansion cooling coil with outside air ventilation to comply with current mechanical code requirements. Refrigerant piping shall extend from the
new air handling unit up to a new air cooled condensing unit (7-1/2-ton capacity) mounted on the existing roof.

**Piping:** All chilled water, hot water, and condensate piping should be replaced back to the equipment source of service. Replacing the piping would eliminate the seasonal changeover issues that affect comfort conditions. All pumps and heat exchangers should also be replaced with new equipment that can be sized to meet the load requirements of a proposed renovation/addition.

**Ventilation:** A new exhaust fan serving the reading room will be mounted on the roof. New ductwork will extend from the fan into the building with grilles. A new elevator is proposed for the building renovation. An elevator cab overrun will require a ventilation louver or fan above the roof to meet the ANSI code. All existing ductwork from air handling units and exhaust fans is extremely dirty and should be removed back to the equipment source. New ductwork will need to be sized to handle the new ventilation requirements. New ceiling mounted exhaust fans for toilet rooms and a new inline exhaust fan for kitchen should be provided. The ductwork will extend out through the sides of the building.

**Controls:** HVAC controls are outdated for currently technology and should be replaced to provide for maximum energy efficiency of all new equipment.

2. **Electrical Systems/Fire Alarm Findings**

**Electric service:** The proposed library expansion will create additional electrical loads of roughly 400 Amps on the 3 Phase, 4 Wire, 120/208 Volt system. This added load will cause an upgrade to the existing building to 800A, 3 Phase, 4 Wire, 120/208V. A new 800 Amp main distribution panel along with a new service shall be installed. All existing breakers serving existing loads to remain shall be replaced with new of the same size. New wiring shall be installed if needed based on the condition of the existing wiring. A new 400 Amp distribution panel shall be installed to serve the lighting, power and HVAC loads of the new addition. Wiring shall be extended in new conduits. Lighting fixtures shall be added throughout the space per architect’s requirement. New lighting controls shall be added to comply with the latest energy requirement. Roughly one fixture is needed per 80 square feet.

**Power and Telecom Outlets:** New power and telecom outlets shall be provided to match the architectural layout of the new extension. Adjustment to the existing layout will be provided as needed. Outlets are typically installed one duplex receptacle per 50 square feet. Telecom outlets are to be installed per the requirements of the architect and DCPL. 15 data outlets should be assumed for this extension.

**Emergency Generator:** A new emergency generator shall be installed. The size of the generator shall be dictated by the loads served per owner directions. The existing
Automatic Transfer switch (ATS) condition shall be verified, and if the size and the operation conditions doesn’t match the needs for the new emergency loads, new ATS shall be installed. Interconnection to the fire alarm system shall also be included.

**Fire Alarm:** Also, all new fire alarm components in the new extension shall be connected to the existing fire alarm control panel. New expander panel shall be installed as necessary. Fire alarm components shall include strobes, audio devices, pull stations etc.

3. **Plumbing Systems/Fire Protection Findings**

**Water Service:** The existing water service seems adequate for the number of fixtures currently installed. If additional fixtures are added for the proposed expansion, then the pipe sizing will be evaluated for proper capacity. A new double check valve backflow preventer must be added to bring the service into compliance with current International Plumbing Code requirements. All replacement equipment will require backflow preventers to be installed on them.

**Domestic Hot Water:** The existing domestic hot water heater should be replaced. As there is no operational circulating pump for the hot water piping in the building, there are various points of lukewarm water throughout the hot water distribution piping. A new gas fired water heater with recirculating pump will be provided as part of the new design scheme.

**Natural Gas Service:** The gas service will be evaluated for proper capacity when new equipment serving the proposed expansion is selected. A new gas meter and regulator may have to be added if a new gas fired emergency generator is provided by the electrical engineer. The emergency generator serving the building is a diesel fired unit. This unit is currently not operational. If the generator is increased in capacity, a natural gas fired generator may be provided to eliminate the diesel tank and piping. Gas service would be extended from a separate meter to the generator.

**Sanitary System:** A visual inspection of the sanitary sewer system with a camera is recommended to create a video report of the sewer routing and condition. This will aid in locating any problems areas that need repair. The sanitary sewer system should be extended and modified to accommodate any new fixtures that will be part of the proposed building expansion.

**Fire Protection:** The existing building currently does not have a fire protection system. The building area falls below the code required square footage area that requires a fire protection system (12,000 sq. ft.). If the proposed building expansion increases a total building area to exceed the 12,000 square feet limit, then a new fire service line must be brought into the building and a wet sprinkler system will be provided for the entire space. The proposed connector under 7th Street SE will be constructed below
ground and will be required to have an automatic sprinkler system to comply with IBC 903.2 of the International Building Code, 2012 Edition.

E. Cost / Risk / Benefit Analysis of the Barracks Row Design

1. Costs:

Refer to Appendix A: Cost Estimates for the full project by trade breakout. The total preliminary cost estimate per the summary below is $29.8 Million. The significant number of Structural considerations listed above, large square footage, schedule required, and complexity of the proposed design contribute to this amount.

Estimated Costs

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<th>$Cost/ Sub-Total</th>
<th>$ Total Cost</th>
<th>% Of</th>
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<td>8.00%</td>
<td>1,358,700</td>
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<tr>
<td>CONSTRUCTION CONTINGENCY</td>
<td>5.00%</td>
<td>917,100</td>
<td></td>
</tr>
<tr>
<td>DC AGENCY MANAGEMENT FEE</td>
<td>20.00%</td>
<td>3,851,000</td>
<td></td>
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<tr>
<td>MAINTENANCE OF TRAVEL BUDGET</td>
<td>3.00%</td>
<td>693,300</td>
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</tr>
<tr>
<td>ESTIMATE CONTINGENCY</td>
<td>25.00%</td>
<td>5,951,200</td>
<td></td>
</tr>
<tr>
<td>TOTAL BUILDING COST</td>
<td>1,496.36</td>
<td>29,800,000</td>
<td></td>
</tr>
</tbody>
</table>

2. Risks:

While there are positives to this design, there are also some associated risks and obstacles.

- First and foremost is the estimated cost of $29.8 Million. A large part of the costs is due to building underground with the need for stronger structures and crossing under 7th Street SE.
- Other risks can also be associated with the below ground construction. The water table elevation is 6 to 8 feet above the finished slab elevation of the addition. Therefore, permanent dewatering is required which has the potential to impact the foundations of surrounding buildings.
- It also creates the possibility of future groundwater leaks into the space if waterproofing materials fail. Providing a solution at such a time would prove to be quite expensive and difficult.
- Finally, the current design overlaps with WMATA’s required horizontal clearance between foundation piles and their existing structures. 635 SF of the current design would need to be cut to keep clear of this perimeter.
There is a possibility of vibration impacts on surrounding structures during construction.

DCPL will need to negotiate a land use agreement with a separate DC Government agency.

The proximity of the Eastern Market Metro Station structure will trigger additional WMATA reviews and approvals within the construction schedule.

3. **Benefits:**

There are several benefits to the Barracks Row design of the library expansion:

- The new space is almost 15,000 square feet, which more than doubles the size of the building.
- Significant flexibility is provided for space utilization.
- This design creates a connection to the Eastern Market Metro Plaza which will help to enhance the larger vision for the space as detailed in the Urban Design Study prepared by the Eastern Market Metro Plaza Task Force.
V. Analysis of Alternative Designs

A. Option 1 – Underpin / Excavate within the Existing Footprint

1. Alternative Design Option 1

   ![Diagram of Alternative Design Option 1]

   **Figure 5.A.1: Section and Plan Diagrams for Alternative Design Option 1**

   - A. 4,132 additional square feet is equivalent to one floor plate. Since the level is below grade, there is potential to expand the footprint to the full extent of the lot.
   - B. Required underpinning is only one story.
   - C. Increased Lower Level height and new story below remain above groundwater level
   - D. Expansion remains within existing footprint, avoids land use agreement for Metro Plaza and tunnel
   - E. Existing roof configuration remains, locate new equipment on south side of building similar to chiller that was installed behind a green wall
2. Cost / Risk / Benefit Analysis of Alternative Design Option 1

Costs: Refer to Appendix A: Cost Estimates for the full by trade breakout. The total preliminary cost estimate per the summary below is $10 Million.

Estimated Costs

<table>
<thead>
<tr>
<th>COSTS BY TRADE</th>
<th>Sub-Total</th>
<th>$ Total Cost</th>
<th>% Of Sub-Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESIGN CONTINGENCY</td>
<td>10.0%</td>
<td>$174.64</td>
<td>721,600</td>
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<tr>
<td>ESCALATION</td>
<td>12.5%</td>
<td>$240.13</td>
<td>902,200</td>
</tr>
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<td>BOND &amp; INSURANCE</td>
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<td>$3.48</td>
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</tr>
<tr>
<td>CONTRACTORS OH &amp; P</td>
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<td>57,700</td>
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<td>CONSTRUCTION CONTINGENCY</td>
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<td>345,600</td>
</tr>
<tr>
<td>MAINTENANCE OF TRAVEL BUDGET</td>
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<td>53,600</td>
</tr>
<tr>
<td>ESTIMATE CONTINGENCY</td>
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<td>TOTAL BUILDING COST</td>
<td>2,420.14</td>
<td>$10,000,000</td>
<td></td>
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</tbody>
</table>

Risks: The primary risks associated with this design are:

- Possible underpinning impact on adjacent structures
- Possible vibration impact on historic buildings

Benefits: The first alternative offers a number of benefits:

- The construction estimate for excavating within the existing footprint came in the lowest of the three alternatives at $10 million. Much of the expected cost savings comes from not having to cross 7th Street with the deep excavation and bypassing of utilities.
- The Alternative Design provides approximately 630 square feet more space than the DCPL program requests
- The expansion level below the existing structure can remain above the water table elevation
- The headroom in the existing Lower Level can be raised by lowering the floor slab.
- A below ground expansion could expand horizontally to the lot boundaries yielding an additional 1800 – 2000 SF of floor space over the 4,132 SF floorplate.
- Reworking the existing Lower Level and adding a new Sub-Basement Level creates an opportunity to rework the stairs and elevator for code compliance and configure new building mechanical systems for better efficiency.
- The design eliminates the need for a land use agreement with another DC government agency
- The design does not trigger review and approval by WMATA.
B. Option 2 – Underpin / Excavate with Prefabricated Tunnel to Underground Expansion

1. **Alternative Design Option 2**

![Diagram](image)

*Figure 5.B.1: Section and Plan Diagrams for Alternative Design Option 2 indicating proposed Alternative overlaid on Barracks Row design*

- Almost 10,000 SF provided while keeping most of the Barracks Row Design elements.
- Design is focused on Metro Plaza but space is more evenly distributed.
- Depth of existing sewer pipes require 2 ½ story deep tunnel.
- Continuous 20-foot-wide tunnel engineered for loads above.
- Tunnel is primarily circulation.
- Underground zone avoids WMATA conflict.
- Tunnel size avoids tree removal.
2. **Cost / Risk / Benefit Analysis of Alternative Design Option 2**

**Costs:** Refer to Appendix A: Cost Estimates for the full by trade breakout. The total preliminary cost estimate per the summary below is $19 Million.

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<tr>
<td><strong>Total Building Cost</strong></td>
<td>2,067.39</td>
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</tr>
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</table>

**Estimated Costs**

**Risks:** While there are positives to this design, there are also some associated risks and obstacles.

- A large amount of the risks are due to building underground with the need for stronger structures and crossing under 7th Street SE.
- Other risks can also be associated with the below ground construction. The water table elevation is 6 to 8 feet above the finished slab elevation of the addition. Therefore, permanent dewatering is required which has the potential to impact the foundations of surrounding buildings.
- It also creates the possibility of future groundwater leaks into the space if waterproofing materials fail. Providing a solution at such a time would prove to be quite expensive and difficult.
- Possible vibration impact on adjacent historic buildings
- Requires land use agreement with another DC agency

**Benefits:** The second alternative offers similar benefits and risks as the Barracks Row design.

- The construction estimate for the reduced scale underground expansion with a tunnel came in at $19 million. Much of the expected cost savings over the Barracks Row design comes from the smaller footprint of the prefabrication tunnel, which can be delivered in sections to allow for faster phased construction.
- The design still provides 10,000 square feet of additional space, which doubles the size of the library.
• This amount of space still allows the library significant flexibility in how the space is utilized.

• This design also creates a connection to the Eastern Market Metro Plaza which will help to enhance the larger vision for the space as detailed in the Urban Design Study prepared by the Eastern Market Metro Plaza Task Force.

C. Option 3 – Attic Expansion

A third option was investigated which involved expanding upward into the existing attic volume. The initial site investigation of the existing mezzanine space revealed a large existing well space under a skylight. Further exploration of the attic space revealed enough height below portions of the roof for accessible space and this option would have avoided underpinning and excavation altogether.

This option was not further developed when the following issues became apparent:

• Zoning only allows 3 occupied stories and the full 3,500 SF program space could not be achieved in the attic volume.

• Accessible circulation and elevator would take up most of the attic level

• The Historic District prohibits roof line alterations so natural light as well as fire rescue would be issues

• The existing structure is not adequate to support additional loads. While this could be overcome, the effort and cost expended would not justify the small gain in usable square footage.

While the existing 2016 Zoning for the site would in theory allow the addition of a third floor with a mechanical penthouse/roof volume above, the obstacles this approach would need to overcome would likely be insurmountable. Both the District of Columbia’s Historic Preservation Review Board and the Commission of Fine Arts would need to approve this major renovation to a structure that contributes to both local and national historic districts. Additionally, the resulting volume would need to be designed in such a way that it did not violate the zoning rule that prohibits new construction from blocking the adjacent properties’ access to natural light. It is unlikely that these requirements could be achieved within a feasible timeframe or cost without offsetting the benefit to the Library.
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VI. RECOMMENDATIONS

A. Short Term Recommendations

In the short term, the focus should be on implementing the items listed under the Existing Facilities Analysis Recommendations. If the selected expansion option will be pursued in the next year, items that will be demolished in that effort should be deferred. For example, placing the elevator on generator power is not a cost-effective solution when each of the expansion options calls for it to be demolished and a new elevator to be placed in a different location.

B. Expansion Recommendations

Several factors outlined above lead to a clear recommended expansion option for DCPL to pursue: Alternative Design Option 1. Underpinning and excavating within the existing footprint provides the following advantages over the other designs that were considered:

- The square footage of the desired program is achieved within the existing site and complies with Zoning.
- The preliminary estimate is $10 Million which is $9 Million less than the other Alternative Design and over $19 Million less than the Barracks Row Design.
- An additional story can be gained with additional ceiling height for the Lower Level while staying above the groundwater elevation.
- The Alternative Design has lower long term operating costs because there is no dewatering or pumping required and no additional maintenance or landscaping costs in the Metro Plaza.
- The Alternative Design focuses on the Library’s site and does not attempt to acquire new property or add extensive space beyond the program.
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VII. APPENDIX A: COST ESTIMATES

A. General Qualifications

1. We recommend the Owner and/or designated representatives review the estimate in detail for items that may not be consistent with the program intent.

2. This estimate of probable construction cost is based on our collective experience. We cannot guarantee that proposals, bids, quantities, and actual construction cost will not vary from our opinion.

3. This estimate is based upon a competitive bid contracting method with five to seven responsible bidders (see chart below for modifications due to number of responsible bidders). Any single source specification selection will have an increased impact on the overall cost.

4. The estimate does not include impacts due to contracting methods other than “open” competitive procurement. Pricing is not valid for negotiated contracts.

5. Pricing is not valid for HUB Zone and “set-aside” contract award.

6. General Exclusions:
   - Professional fees, inspections and/or third party testing
   - Owner furnished items
   - Unforeseen sub-surface or existing conditions
   - State/Local license, fees and/or permits

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<th>No. Bidders</th>
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<td>3</td>
<td>110%</td>
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<tr>
<td>4</td>
<td>107%</td>
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<tr>
<td>5</td>
<td>104%</td>
</tr>
<tr>
<td>6</td>
<td>102%</td>
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<td>98%</td>
</tr>
<tr>
<td>9</td>
<td>97%</td>
</tr>
<tr>
<td>10</td>
<td>95%</td>
</tr>
</tbody>
</table>

Data Source: USACE
• Permanent utility consumption charges (gas, power & water)
• Temporary utility consumption charges (gas, power & water)
• Permanent phone service cost
• Furniture, fixtures & equipment (FF&E)
• Owner’s contingency

B. Estimate Basis

1. Basis
   • Specifications: N/A
   • Drawings: Amy Weinstein & McKissack Team Option Design documents
   • Other: Site visit assessment report my McKissack Team

2. Format
   • This estimate is presented in CostWorks Modeling Format in Uniformat
   • The following Work Breakdown Structure (WBS) has been utilized to further segregate cost:
     • N/A

3. Labor Rates
   Labor rates are based on local prevailing wages and are fully burdened to include both direct and indirect subcontract mark-ups. Labor Rates include base, fringes, payroll taxes and insurance, small tools, consumables, field supervision and field overhead as well as subcontractor overhead and profit.

4. Design Contingency
   Design Contingency is considered to be owned by the project. At each milestone estimate, contingency (based on the level of design detail available) is applied against the total estimated construction cost, including General Conditions (when applicable). This risk-based contingency is intended to cover the cost associated with the further refinement of the design and details that are not completed on the plans. As the design details increase at each milestone estimate, the contingency decreases until, at 100% design completion, the contingency is 0%. The following graph is a theoretical representation of this process.
Design Contingency is not intended to cover owner changes nor does it address unforeseeable events such as labor strikes, natural disasters or extraordinary economic events. Current design contingency incorporated into the estimate is 10%.

5. Construction Contingency

Construction Contingency is a typical consideration on any Guaranteed Maximum Price (GMP) contract. It is often owned by the project but controlled by the owner. Meaning, the owner has approval rights as to whether this contingency fund is utilized. Its purpose is to cover purchasing gaps and omissions in the GMP bidding process and to cover unforeseen costs due to weather or scheduling conflicts. Typically, as part of a GMP, the unspent portion of the construction contingency is returned to the owner when the project is closed out. Current construction contingency incorporated into the estimate is 5%.

6. Owner’s Contingency

Owner’s Contingency is a recommended amount to cover the costs associated with unforeseen conditions during the construction phase such as unknown site conditions, schedule delays and trade coordination issues that may lead to change orders. This contingency is not meant for scope enhancements or for additions to the project. The suggested percentage for Owner’s Contingency is based on Industry standards for the type and location of the project.

Owner’s Contingency is not included in this estimate. However, we are including a DC Agency Management Fee of 20%, as per previous concept estimates have included.
7. Escalation

The pricing presented herein is based on current market costs. An escalation rate is applied at the summary level of the estimate for costs associated with the following:

- Yearly merit raises for open shop contractors.
- Yearly renegotiation of union agreements.
- Material price increases (typically assessed quarterly).

Escalation is not intended to cover increases due to fluctuations in market conditions such as over saturation of projects during the anticipated bidding phase or temporary reductions in availability of manpower for selected labor pools. Escalation is currently incorporated into the estimate at 12.50%. This percentage could change dependent on how soon or how far out the project starts.

C. Constructability Comments

- Constructability comments have been included in the report by the architects and engineers, and their comments have been incorporated into each of the three estimates.

D. Project Qualifications

General Notes:

1. Due to the preliminary/concept design of the project, the total building cost incorporates substantial “below-the-line” markups to account for unknowns and project uncertainties. The following markups account for over 43% of the Total Project Cost. However, as the design progresses to Construction Document (CD) phase, the contingency markups will be reduced to zero.

- Design Contingency 10.00%
- Escalation 12.50%
- DC Agency Management Fee 20.00%
- Estimate Contingency 25.00%
E. Barracks Row Design Cost Estimate

The Barracks Row design is the most expensive of all the three options. It provides the greatest amount of increase in floor space addition but also has the longest construction duration, the most site impact, and the most street, traffic and utility impact.

The standard foundation systems, basement excavation, underpinning, shoring, 24-hour dewatering, waterproofing, and drainage are the drivers to the direct cost total.

The demolition and relocation of the elevator system is also another factor that has a substantial cost element to it.

Finally, the open cut of 7th street to install the cast-in-place tunnel system, the pop-up in the park across the street, along with the complete site restoration (tree removal and fines for such) are additional cost drivers to the direct cost.
Figure VII-E Barracks Row Design Cost Estimate

### Preliminary Cost Report

**Project Name:** DCPL Southeast Library - AW Concept

**Model Type:** Library (Green), Limestone with Brick and Glass Framing

<table>
<thead>
<tr>
<th>A Substructure</th>
<th>Location: Washington, DC</th>
<th>Data Release: 2016 Q1</th>
<th>Wage Rate: Union</th>
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<tbody>
<tr>
<td>A1010 Standard Foundations</td>
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<td>A1030 Slab on Grade</td>
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<tr>
<td>B Shell</td>
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<td>C1010 Partitions</td>
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<td>C1020 Interior Doors</td>
<td>$3.05</td>
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<tr>
<td>C2010 Stair Construction</td>
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<td>C3010 Wall Finishes</td>
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<td>C3020 Floor Finishes</td>
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<td>C3030 Ceiling Finish</td>
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### Services

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<td>D1010 Elevators and Lifts</td>
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<td>D3050 Terminal &amp; Package Units</td>
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<td>D5010 Electrical Service/Distribution</td>
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<td>D5030 Communications and Security</td>
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<td>D5090 Other Electrical Systems</td>
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### Equipment & Furnishings

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<td>E1090 Other Equipment</td>
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<td>E2020 Moveable Furnishings</td>
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### Special Construction & Demolition

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<td>F1030 Special Construction Systems (demo &amp; relocate elevator + new elevator)</td>
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### Site Development

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<tr>
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<td>G9090 Other Site Systems &amp; Equipment (Traffic Control)</td>
<td>$22.50</td>
<td>$44,100</td>
<td></td>
</tr>
</tbody>
</table>

**Sub-Total** | $675.03 | $13,455,100 | 100.0% |

**Design Contingency** | 10.00% | 67.56 | 1,345,500 |
**Escalation** | 12.50% | 92.90 | 1,850,100 |
**Bond & Insurance** | 2.00% | 16.72 | 333,000 |
**Contractors OH & P** | 8.00% | 68.22 | 1,358,700 |
**Construction Contingency** | 5.00% | 40.05 | 917,100 |
**DC Agency Management Fee** | 20.00% | 193.42 | 3,851,900 |
**Maintenance of Travel Budget** | 3.00% | 34.81 | 693,300 |
**Estimate Contingency** | 25.00% | 298.83 | 5,951,200 |

**Total Building Cost** | $1,496.36 | $29,800,000 |
F. Alternative Design Option 1 Cost Estimate

The McKissack Option 1 – Straight Down Design is the most cost effective of the designs. It more than fully meets the criteria for space requirements by the DC Public Library System’s directive for this project.

The only real drivers to the direct cost for this option are the elements associated with the excavation, shoring, dewatering and building development directly underneath the existing footprint of the library.

There are no cost-driving tasks that are associated with the park across the street, 7th Street disturbances, or major site impacts other than excavation and shoring at the perimeter of the building.

This option is the least in total project cost of the three options.
### Preliminary Cost Report

**Project Name:** DCPL Southeast Library - M&M Option

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<td>Story Height (L.F.): 18</td>
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<td>Floor Area (S.F.): 4735</td>
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*Includes 10% perimeter overdig for excavation*

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<tr>
<th>Substructure</th>
<th>$Cost/Per S.F.</th>
<th>$Total Cost</th>
<th>% Of Sub-Total</th>
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<tbody>
<tr>
<td>A1010 Standard Foundations</td>
<td>1,228.89</td>
<td>5,077,800</td>
<td>79.4%</td>
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<tr>
<td>A1030 Slab on Grade</td>
<td>26.25</td>
<td>108,500</td>
<td>1.6%</td>
</tr>
<tr>
<td>A2010 Basement Excavation (inc. shoring &amp; dewatering)</td>
<td>1,050.00</td>
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<td>A2020 Basement Walls (inc. waterproofing &amp; drainage)</td>
<td>56.58</td>
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<tr>
<td>B Shell</td>
<td>58.01</td>
<td>239,700</td>
<td>3.5%</td>
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<tr>
<td>B1010 Floor Construction</td>
<td>31.33</td>
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<td>1.9%</td>
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<tr>
<td>B1020 Roof Construction</td>
<td>28.25</td>
<td>104,300</td>
<td>1.5%</td>
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<tr>
<td>C Interiors</td>
<td>6.95</td>
<td>28,700</td>
<td>0.4%</td>
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<tr>
<td>C1010 Partitions</td>
<td>17.35</td>
<td>71,700</td>
<td>1.0%</td>
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<tr>
<td>C1020 Interior Doors</td>
<td>3.05</td>
<td>12,600</td>
<td>0.2%</td>
</tr>
<tr>
<td>C2010 Stair Construction</td>
<td>22.87</td>
<td>94,500</td>
<td>1.4%</td>
</tr>
<tr>
<td>C3010 Wall Finishes</td>
<td>2.54</td>
<td>10,500</td>
<td>0.2%</td>
</tr>
<tr>
<td>C3020 Floor Finishes</td>
<td>5.25</td>
<td>21,700</td>
<td>0.3%</td>
</tr>
<tr>
<td>C3030 Ceiling Finishes</td>
<td>0.76</td>
<td>30,700</td>
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<tr>
<td>D Services</td>
<td>137.46</td>
<td>567,900</td>
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</tr>
<tr>
<td>D1010 Elevators and Lifts</td>
<td>19.75</td>
<td>81,600</td>
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</tr>
<tr>
<td>D2010 Plumbing Fixtures</td>
<td>4.56</td>
<td>18,600</td>
<td>0.3%</td>
</tr>
<tr>
<td>D2020 Domestic Water Distribution</td>
<td>2.56</td>
<td>10,600</td>
<td>0.2%</td>
</tr>
<tr>
<td>D2040 Rain Water Drainage</td>
<td>12.91</td>
<td>53,700</td>
<td>0.7%</td>
</tr>
<tr>
<td>D3040 Distribution Systems</td>
<td>26.25</td>
<td>108,500</td>
<td>1.6%</td>
</tr>
<tr>
<td>D3050 Terminal &amp; Package Units</td>
<td>18.06</td>
<td>74,600</td>
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<tr>
<td>D4010 Sprinklers</td>
<td>4.25</td>
<td>17,600</td>
<td>0.3%</td>
</tr>
<tr>
<td>D4020 Standpipes</td>
<td>3.25</td>
<td>13,400</td>
<td>0.2%</td>
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<tr>
<td>D5010 Electrical Service/Distribution</td>
<td>12.49</td>
<td>51,600</td>
<td>0.7%</td>
</tr>
<tr>
<td>D5020 Lighting and Branch Wiring</td>
<td>18.68</td>
<td>77,200</td>
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<tr>
<td>D5030 Communications and Security</td>
<td>6.25</td>
<td>25,800</td>
<td>0.4%</td>
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<tr>
<td>D5090 Other Electrical Systems</td>
<td>8.45</td>
<td>34,900</td>
<td>0.5%</td>
</tr>
<tr>
<td>E Equipment &amp; Furnishings</td>
<td>35.70</td>
<td>147,500</td>
<td>2.2%</td>
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<tr>
<td>E1090 Other Equipment</td>
<td>13.20</td>
<td>54,800</td>
<td>0.8%</td>
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<tr>
<td>E2090 Movable Furnishings</td>
<td>22.50</td>
<td>93,000</td>
<td>1.4%</td>
</tr>
<tr>
<td>F Special Construction &amp; Demolition</td>
<td>177.25</td>
<td>381,200</td>
<td>5.9%</td>
</tr>
<tr>
<td>F1030 Special Construction Systems (demo &amp; relocate elevator)</td>
<td>85.00</td>
<td>351,200</td>
<td>5.2%</td>
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<tr>
<td>F2010 Building Elements Demolition (incl. hauling)</td>
<td>85.00</td>
<td>351,200</td>
<td>5.2%</td>
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<tr>
<td>F2020 Hazardous Components Abatement</td>
<td>7.25</td>
<td>30,000</td>
<td>0.5%</td>
</tr>
<tr>
<td>G Building Site Work</td>
<td>52.50</td>
<td>216,600</td>
<td>3.2%</td>
</tr>
<tr>
<td>G2040 Site Development (restore site &amp; surroundings)</td>
<td>52.50</td>
<td>216,600</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

**Sub-Total** | 1,746.37 | 7,216,000 | 93.7%

**Design Contingency** | 10.00% | 174.64 | 72,600 |
**Escalation** | 12.50% | 240.13 | 992,200 |
**Bond & Insurance** | 2.00% | 3.48 | 14,400 |
**Contractors OH & P** | 8.00% | 13.96 | 57,700 |
**Construction Contingency** | 5.00% | 20.74 | 85,700 |
**DC AGENCY MANAGEMENT FEE** | 20.00% | 83.64 | 345,600 |
**Maintenance of Travel Budget** | 3.00% | 12.97 | 53,600 |
**Estimate Contingency** | 25.00% | 113.24 | 467,000 |

**Total Building Cost** | 2,420.14 | 10,000,000 |
G. Alternative Design Option 2 Cost Estimate

The McKissack Option 2 – Prefab Tunnel Design is a variation on the Barracks Row and McKissack Option 1 Design. It incorporates less of a footprint across the street at the popup along with a reduced tunnel size that allows for the non-impact to the tree removal and associated fines that the Barracks Row Design did.

Again, the basement excavation, shoring, 24-hour dewatering, waterproofing, and drainage are major direct cost drivers, along with the installation of the prefab tunnel system under 7th Street.

The cost savings versus the Barracks Row Design is due to the lesser site impact due to the reduction is gross square footage gained with this option. The prefab tunnel allows for a more efficient installation and therefore less of a traffic and site impact to the 7th street crossing.

This option also more than fully meets the criteria that the DC Public Library System has identified and incorporates the surrounding communities input.
**Figure VII-G Alternative Design Option 2 Cost Estimate**

### Preliminary Cost Report

**Project Name:** DCPL Southeast Library - M&M Option

**Model Type:** Library (Green), Limestone with Brick and Glass Framing

<table>
<thead>
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<th>Stories (Ea.)</th>
<th>1</th>
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</thead>
<tbody>
<tr>
<td>Story Height (L.F.)</td>
<td>20</td>
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<tr>
<td>Floor Area (S.F.)</td>
<td>4735</td>
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**Location:** Washington, DC

**Data Release:** 2016 Qtr 1

**Wage Rate:** Union

<table>
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<tr>
<th>Substructure</th>
<th>$Cost/Per S.F.</th>
<th>Total Cost</th>
<th>% Of Sub-Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Substructure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1010 Standard Foundations</td>
<td>26.25</td>
<td>124,300</td>
<td>27.7%</td>
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<td>A1030 Slab on Grade</td>
<td>25.39</td>
<td>120,200</td>
<td></td>
</tr>
<tr>
<td>A2010 Basement Excavation (incl. shoring &amp; dewatering &amp; underpinning)</td>
<td>450.00</td>
<td>2,130,800</td>
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<tr>
<td>B Shell</td>
<td>31.33</td>
<td>148,300</td>
<td>1.7%</td>
</tr>
<tr>
<td>B1010 Floor Construction</td>
<td>31.33</td>
<td>148,300</td>
<td></td>
</tr>
<tr>
<td>C Interiors</td>
<td>64.01</td>
<td>303,100</td>
<td>3.5%</td>
</tr>
<tr>
<td>C1010 Partitions</td>
<td>17.35</td>
<td>82,200</td>
<td></td>
</tr>
<tr>
<td>C1020 Interior Doors</td>
<td>3.05</td>
<td>14,400</td>
<td></td>
</tr>
<tr>
<td>C2010 Stair Construction</td>
<td>22.87</td>
<td>108,300</td>
<td></td>
</tr>
<tr>
<td>C3010 Wall Finishes</td>
<td>2.54</td>
<td>12,000</td>
<td></td>
</tr>
<tr>
<td>C3020 Floor Finishes</td>
<td>5.25</td>
<td>24,900</td>
<td></td>
</tr>
<tr>
<td>C3030 Ceiling Finishes</td>
<td>12.55</td>
<td>61,300</td>
<td></td>
</tr>
<tr>
<td>D Services</td>
<td>202.89</td>
<td>960,600</td>
<td>11.2%</td>
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<td>D1010 Elevators and Lifts</td>
<td>19.75</td>
<td>93,500</td>
<td></td>
</tr>
<tr>
<td>D2010 Plumbing Fixtures</td>
<td>4.56</td>
<td>21,650</td>
<td></td>
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<tr>
<td>D2020 Domestic Water Distribution</td>
<td>17.50</td>
<td>82,000</td>
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</tr>
<tr>
<td>D2030 Sanitary Waste (includes sewer ejector system)</td>
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<td>34,300</td>
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<tr>
<td>D2040 Rain Water Drainage</td>
<td>12.91</td>
<td>61,100</td>
<td></td>
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<tr>
<td>D3040 Distribution Systems</td>
<td>4.69</td>
<td>22,200</td>
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<tr>
<td>D3050 Terminal &amp; Package Units</td>
<td>38.05</td>
<td>180,200</td>
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<tr>
<td>D4010 Sprinklers</td>
<td>4.25</td>
<td>20,100</td>
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<tr>
<td>D4020 Standpipes</td>
<td>3.25</td>
<td>15,400</td>
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<tr>
<td>D4090 Other Fire Protection Systems (FDC)</td>
<td>2.75</td>
<td>13,000</td>
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<tr>
<td>D5010 Electrical Service/Distribution</td>
<td>27.50</td>
<td>130,200</td>
<td></td>
</tr>
<tr>
<td>D5020 Lighting and Branch Wiring</td>
<td>18.68</td>
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<tr>
<td>D5030 Communications and Security</td>
<td>6.25</td>
<td>29,600</td>
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<tr>
<td>D5090 Other Electrical Systems (including new controls)</td>
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<tr>
<td>E Equipment &amp; Furnishings</td>
<td>35.70</td>
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<tr>
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<td>13.20</td>
<td>62,500</td>
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</tr>
<tr>
<td>E2020 Moveable Furnishings</td>
<td>22.50</td>
<td>106,500</td>
<td></td>
</tr>
<tr>
<td>F Special Construction &amp; Demolition</td>
<td>177.25</td>
<td>839,300</td>
<td>9.8%</td>
</tr>
<tr>
<td>F1030 Special Construction Systems (demo &amp; relocate elevator)</td>
<td>85.00</td>
<td>402,500</td>
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<tr>
<td>F2010 Building Elements Demolition (incl. hauling)</td>
<td>85.00</td>
<td>402,500</td>
<td></td>
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<tr>
<td>F2020 Hazardous Components Abatement</td>
<td>7.25</td>
<td>34,300</td>
<td></td>
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<tr>
<td>G Building Sitework</td>
<td>801.35</td>
<td>3,794,400</td>
<td>44.2%</td>
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<tr>
<td>G2040 Site Development (restore site &amp; surroundings)</td>
<td>52.50</td>
<td>248,600</td>
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<tr>
<td>G2040 Site Development (Park Pop-Up across street)</td>
<td>450.00</td>
<td>2,130,800</td>
<td></td>
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<tr>
<td>G2090 Service &amp; Pedestrian Tunnels - Prefabricated</td>
<td>276.35</td>
<td>1,308,500</td>
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<tr>
<td>G2090 Other Site Systems &amp; Equipment (Traffic Control)</td>
<td>22.50</td>
<td>106,500</td>
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</tr>
<tr>
<td>Sub-Total</td>
<td>1,814.15</td>
<td>8,590,000</td>
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</tbody>
</table>

- **DESIGN CONTINGENCY:** 10.00% 181,410 859,000
- **ESCALATION:** 12.50% 249,440 1,181,100
- **BOND & INSURANCE:** 2.00% 44,900 212,600
- **CONTRACTORS OH & P:** 8.00% 183,190 867,400
- **CONSTRUCTION CONTINGENCY:** 5.00% 123,650 585,500
- **DC AGENCY MANAGEMENT FEE:** 20.00% 519,350 2,459,100
- **MAINTENANCE OF TRAVEL BUDGET:** 3.00% 93,470 442,600
- **ESTIMATE CONTINGENCY:** 25.00% 802.39 3,799,300

**TOTAL BUILDING COST:** 2,057.39 19,000,000
VIII. APPENDIX B: REFERENCE DOCUMENTS

A. Documents received from District of Columbia Public Library

1. Building Condition Survey Southeast Library Update
   Office of Property Management Office of Standards & Inspections
   2004

2. Southeast Branch Library Building Condition Survey
   Office of Property Management Office of Standards & Inspections
   January 2001

3. Eastern Market Metro Station Park and Plaza Urban Design Study
   Eastern Market Metro Plaza Task Force
   January 2010

4. Southeast Neighborhood Library Proposed Space and Service Consideration
   District of Columbia Public Library
   2016

5. Southeast Library Various Drawings
   Tyco Fire & Security, SimplexGrinnell, The Georgetown Design Group, Bell Architects,
   Advanced Consulting Engineering Ltd., HMA
   Date Varies

B. Documents received from Others

1. Geotechnical Report – Hine Junior High School Site Development
   Schnabel Engineering
   June, 2010

2. DC Zoning Maps
   District of Columbia Office of Zoning
   2016

   National Park Service
   1993
4. **Adjacent Construction Project Manual**
   Washington Metropolitan Area Transit Authority Office of Joint Development & Adjacent Construction
   September 2015

5. **Eastern Market Metro Park Library Concept Sketches**
   May 2014

6. **Water and Sewer records**
   DC Water
   Date Varies

7. **Hine Project engineering plans**
   Various engineering & design firms
   March 2013